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(54) Devices and method for examining connectors

Vorrichtungen und Verfahren zum Überprüfen von Verbindern

Appareils et procédé pour l'examen de connecteurs

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Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to a connector examination device and method for detecting improper attachment of a metal terminal inserted in a connector housing.

[0002] Generally, a connector comprises a connector housing of a plastics material in which metal terminals, each fixedly secured to one end of a wire, are mounted, and each metal terminal is retained against withdrawal by a lance (elastic retaining pawl) formed integrally within the connector housing. When the metal terminal is inserted into the connector housing, the lance is flexed downwardly toward a flexing space until the metal terminal is inserted into a proper position, at which point the lance is elastically restored to engage a void formed along a bottom surface of the metal terminal, thereby preventing withdrawal of the metal terminal.

[0003] With this type of terminal withdrawal prevention construction, a certain degree of a frictional force acts between the metal terminal and the lance when the metal terminal is inserted. The frictional force is of such a degree that the metal terminal cannot be inserted into the housing any further, which may give the impression to an operator that the terminal is reliably secured by the lance, even though it is not properly inserted into the housing. Accordingly, the operator, engaged in the inserting operation, may misunderstand that complete insertion has been achieved, and may stop the inserting operation before the lance actually engages the terminal.

[0004] However, if the metal terminal is not completely inserted into the proper position where the metal terminal engages the lance in the connector housing, the metal terminal can become withdrawn from the housing during use. Therefore it is necessary to preliminarily inspect the terminal connections to correct any improperly inserted or incompletely connected terminals.

[0005] Recently, various kinds of connector examination devices have been developed for detecting improper attachment of a metal terminal. The present applicant filed an application (Japanese Patent Application No. 5-281716) shown in Fig. 7. In this construction, a lance check pin 51 is provided in a projected manner in opposed relation to each lance 61 in a connector 60, and the lance check pin 51 is adapted to be inserted into a lance flexing space 63 formed in a connector housing 62. When a metal terminal 65 is completely inserted into a proper position, the lance check pin 51, inserted in the lance flexing space 63, does not strike against the lance 61, but is brought into underlying relation with the lance, as shown at an upper stage in Fig. 7. When the metal terminal 65 is in an improperly-attached condition, the lance check pin 51 strikes against the distal end of the lance 61 that is elastically deformed in the lance flexing space 63, as shown at a lower stage in Fig. 7. In this construction, when the metal terminal 65 is in an improperly-attached condition, with the lance 61 disposed in the lance flexing space 63, the lance check pin 51 strikes against the distal end of the lance 61. Accordingly, the check pin 51 cannot be positioned beneath the lance 61. As a result, improper attachment of the metal terminal 65 occurs.

[0006] For molding reasons, even when the metal terminal 65 is completely inserted into the proper position, with the lance 61 substantially retracted from the lance flexing space 63 and into the terminal 65, the lance 61 still projects slightly inwardly towards an inner wall surface of the lance flexing space 63. In this connection, a distal end portion 51a of the lance check pin 51 is made smaller in thickness than the lance flexing space 63 so that the lance check pin can be brought into underlying relation to the lance 61. Therefore, a gap is formed between the distal end portion 51a of the lance check pin 51 and the bottom portion of the terminal 65.

[0007] Therefore, it is possible that when the lance check pin 51 is inserted into the lance flexing space 63, the distal end portion 51a of the lance check pin 51 is inserted into the lance flexing space 63 in a bent, deformed manner, or the lance check pin 51 is inserted obliquely. In such a situation, even when the metal terminal 65 is completely inserted into the proper position, with the lance 61 fully retracted from the lance flexing space 63, the distal end portion 51a of the lance check pin 51 can strike against the slightly-projected portion of the lance 61. As a result, despite the fact that the metal terminal 65 is disposed in the proper position, the lance check pin 51 can not reach the position beneath the lance 61, and therefore it may be erroneously judged that the metal terminal 65 is in an improperly-attached condition.

[0008] In addition, there have been several proposed devices to confirm and inspect the position of the terminal. For example, a retainer that engages the metal terminal (with which the lance is also engaged) is inserted into the housing when an operator believes that the terminal is in the properly-inserted position, thus providing, together with the lance, a second engagement if the terminal is inserted to a depth where the lance engages a void or hole in the terminal. The retainer is provisionally attached to the connector before the metal terminals are inserted, and in this condition, after the metal terminals are inserted, the retainer is moved into a completely-attached position to engage the metal terminals.

[0009] At this time, if the metal terminal is disposed in an improperly-inserted position (short of the properly-inserted position), the retainer engages the metal terminal, and can not be moved into the completely-attached position. Thus, the retainer indicates whether the metal terminals have been inserted into the properly-inserted position. If it is judged that any metal terminal has not been inserted into the properly-inserted position, i.e., the retainer engages the metal terminal rather than a recess or the void of the metal terminal, the metal ter-

minal is removed and tried again.

[0010] In the above method in which the retainer is used to determine proper positioning of the terminals, the retainer, mounted on the connector in the completely-attached position, remains connected to the connector, and even after the inspecting of the terminal is complete, the retainers remain mounted on the connector housings. Therefore, inspection of the terminals requires a permanently mounted retainer for each terminal and therefore the cost and number of the parts required for inspecting terminals is high.

[0011] Moreover, the retainer merely judges whether the metal terminal is disposed in the properly-inserted position or an improperly-inserted position, and when it is judged that the metal terminal is in the improperly-inserted position, an operator is required to remove the terminal and attempt to reinsert the terminal. After the retainer is attached again, the condition of insertion of the metal terminals is rechecked, thus requiring even more time and labor. Therefore, the overall efficiency of the metal terminal-inserting operation suffers.

[0012] Document JP-Y-62 047 093 discloses a device that checks the correct insertion of a metal terminal by providing electrical slide contacts which abut a metal terminal to determine when the metal terminal is in a correct position. A stationary protruding element can be inserted into a lance flexing space to determine whether the lances are in a correct position.

SUMMARY OF THE INVENTION

[0013] The present invention has been made under the above circumstances, and an object of the invention is to provide a connector examination device and method capable of judging with certainty whether a metal terminal is attached in a proper or an improper condition, and can effect a highly reliable inspection.

[0014] These objects may be solved by the feature combinations of independent claims 1, 4 and 13.

[0015] To achieve the above objects, in an aspect of the present invention, there is provided a connector examination device according to claim 1 having lance check pins that can be inserted into lance flexing spaces for allowing elastic deformation of the lance during the insertion of a metal terminal. The lance check pin is inserted into the lance flexing space and abutted against the lance when the metal terminal assumes an improperly-attached condition. The lance check pin includes a guide portion for contacting an inner surface of the lance flexing space so as to keep the lance check pin in the proper position in the lance flexing space. A judgment device judges from the position of the lance check pin whether the lance check pin is abutted against the lance.

[0016] Further, there is provided an inspection housing having a setting portion for receiving a connector to be examined; sliders mounted on the inspection housing for movement toward and away from the connector; one of the lance check pins provided on each of the sliders; and one of the judgment devices being mounted on each of the sliders.

[0017] Moreover, there can be provided a connector holder for holding a connector to be examined; the inspection housing provided in opposed relation to the connector holder; a drive mechanism for reciprocally moving one or both of the connector holder and said inspection housing toward each other.

[0018] The judgment means comprises an electrical contact member mounted for movement with the lance check pin to engage the metal terminal received and retained in the proper position in the connector housing against withdrawal. The electrical contact member is connected to a conduction examination circuit for a wire harness. The lance check pin may have a relief recess for preventing the guide portion from interfering with stabilizers extending from the metal terminal and straddling opposite sides of said lance.

[0019] According to another aspect of the present invention, there is provided a device for inspecting a terminal inserted within a connector housing according to claim 4. The connector has a lance capable of securing the terminal in a locking position and a lance flexing space into which the lance flexibly extends as the terminal is inserted within the connector housing. The device includes a lance check pin that is inserted into the lance flexing space, and means provided on the lance check pin for guiding a tip portion of the lance check pin in a first position below a bottom portion of the lance when the lance is disposed in the locking position, even when the lance partially protrudes within the lance flexing space and the tip portion is at least one of irregularly formed and obliquely inserted.

[0020] According to another aspect of the present invention there is provided a method according to claim 13 of inspecting a terminal inserted within a connector housing having a lance capable of securing the terminal in a locking position, and a lance flexing space into which the lance flexibly extends as the terminal is inserted within the connector housing. The method includes the steps of inserting a lance check pin within the lance flexing space, and guiding a tip portion of the check pin by means provided on the lance check pin in a first position below a bottom portion of the lance when the lance is disposed in the locking position, even when the lance partially protrudes within the lance flexing space and the tip portion is at least one of irregularly formed and obliquely inserted.

[0021] With an examination device and method having these features, the lance engages the metal terminal, and is retracted from the lance flexing space when the metal terminal is inserted into the proper position in the connector housing. When the metal terminal is disposed in an incompletely-inserted position (short of the proper position), the lance does not engage the metal terminal, and is elastically deformed into the lance flexing space.

[0022] When the metal terminal is inserted into the

proper position, with the lance retracted from the lance flexing space, the lance check pin, inserted into the lance flexing space, will not abut against the lance, and is therefore positioned below the lance. The judgment device judges from the position of the lance check pin that the lance check pin is not abutted against the lance. Accordingly, a properly inserted metal terminal that is completely inserted into the housing can be detected.

[0023] In contrast, when the metal terminal in the connector is disposed in an incompletely-inserted position, with the lance flexed into the lance flexing space, the lance check pin abuts against the lance, and therefore is prevented from further insertion. The judgment device judges from the position of the thus shallowly-inserted lance check pin that the lance check pin is abutted against the lance, and in accordance with this, the fact that the metal terminal is in an improperly-inserted condition is detected.

[0024] In the connector examination device, the connector to be examined is received in the setting portion of the inspection housing, and each slider is moved to attempt insertion of the lance check pin into the lance flexing space in the connector to examine the position of the check pin.

[0025] When the metal terminal in the connector is inserted into the proper position, with the lance retracted from the lance flexing space, the lance check pin will not abut against the lance, and therefore is inserted below the lance. The judgment device judges from the position of the lance check pin that the lance check pin is not abutted against the lance, and in accordance with this, the fact that the metal terminal is completely inserted into the proper position is detected.

[0026] In contrast, when the metal terminal in the connector is disposed in an incompletely-inserted position, with the lance flexed into the lance flexing space, the lance check pin abuts against the lance, and therefore is prevented from further insertion so that the slider is prevented from moving toward the connector. The judgment device judges from the position of the shallowly-inserted lance check pin that the lance check pin is abutted against the lance, and in accordance with this, the fact that the metal terminal is in an improperly-inserted condition is detected.

[0027] In the connector examination device, the connector to be examined can be set in the connector holder, and the drive mechanism moves the inspection housing and the connector holder toward each other, so that each lance check pin is inserted into the associated lance flexing space in the connector housing, thereby effecting terminal position examination.

[0028] When the metal terminal in the connector is inserted into the proper position, with the lance retracted from the lance flexing space, the lance check pin will not abut against the lance, and therefore is inserted deep. The judgment device judges from the position of the thus deeply-inserted lance check pin that the lance check pin is not abutted against the lance, and in accordance with this, the fact that the metal terminal is completely inserted into the proper position is detected.

[0029] In contrast, when the metal terminal in the connector is disposed in an incompletely-inserted position, with the lance flexed into the lance flexing space, the lance check pin abuts against the lance, and therefore is prevented from further insertion. The lance check pin and the slider are moved backward relative to the inspection housing. The judgment device judges from the position of the thus shallowly-inserted lance check pin that the lance check pin is abutted against the lance, and in accordance with this, the fact that the metal terminal is in an improperly-inserted condition is detected.

[0030] The guide portion of the lance check pin inserted into the lance flexing space is brought into contact with the inner surface of the lance flexing space, and by doing so, the lance check pin can be inserted into the lance flexing space while being kept in the proper posture. Namely, even if the lance check pin is bent or deformed, or if the lance check pin is inserted obliquely into the lance flexing space, such deformation and oblique insertion are corrected in the lance flexing space by guiding portions formed on the check pins, so that the lance check pin can be inserted into the lance flexing space while kept in the proper posture.

[0031] When the lance check pin is inserted without abutting the lance, the electrical contact member provided on the judgment device contacts the metal terminal to make an electrical connection, so that detection of the completely inserted position of the metal terminal can be detected. In contrast, when the lance check pin abuts against the lance, the electrical contact member does not contact the metal terminal, so that the electrical connection is not achieved. As a result, the improperly-inserted condition of the metal terminal is detected.

[0032] Furthermore, because each electrical contact member is connected to the conduction examination circuit for a wire harness, examination for the wire harness and the examination for the position of attachment of the metal terminal can be carried out at the same time. In addition, the metal terminal can have stabilizers extending at the opposite sides of the lance, and even when the stabilizers project into the lance flexing space, the stabilizers will not interfere with the guide portion of the lance check pin.

[0033] Further objects, features and advantages of the present invention will become apparent from the detailed description of preferred embodiments which follows, when considered together with the attached figures of drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] The invention will be described in detail with reference to the following drawings, wherein:

Fig. 1 is a cross-sectional view showing a first embodiment of a connector examination device of the

present invention;

Fig. 2 is a fragmentary, enlarged view showing a lance of a connector and a lance check pin;

Fig. 3 is a cross-sectional view of the examination device, showing a condition in which the connector is set;

Fig. 4 is an enlarged, cross-sectional view showing the positional relation between the lance and the lance check pin in an upper stage of Fig. 3;

Fig. 5 is a cross-sectional view taken along the line V-V of Fig. 4;

Fig. 6 is a cross-sectional view of a second embodiment of a connector examination device of the invention;

Fig. 7 is a cross-sectional view of a connector examination device shown for comparison purposes; and

Fig. 8 is an enlarged, cross-sectional view of a portion of Fig. 7.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0035] A first embodiment of the terminal inspecting apparatus and method aspects of the present invention will now be described with reference to Figs. 1 to 5.

[0036] Reference is first made to the construction of a connector 30 to be examined by the use of an examination device 10.

[0037] A connector housing 31 is molded of a resin, and has a rectangular configuration as a whole. A plurality of cavities 32 are formed in the connector housing, and are arranged in upper and lower stages. Each cavity 32 extends through the connector housing from its front to its rear end, and a metal terminal 33 is inserted into the cavity 32 from a rear side (i.e., the right side in Fig. 1). The metal terminal 33, having a wire 35 compressively connected thereto, is of a known construction, and is of the female type that mates with a male metal terminal of a mating connector (not shown).

[0038] Lances 34 for retaining the respective metal terminals 33 against withdrawal are formed integrally on the connector housing 31. The lance 34 is in the form of an elastically-deformable projecting piece, and has a retaining portion 34a formed adjacent to its distal end. The retaining portion 34a projects toward the associated cavity 32.

[0039] A lance flexing space 32a for allowing downward elastic deformation of the lance 34 is provided within the cavity 32, the lance flexing space being formed utilizing a mold release space. The lance flexing space 32a is open to the front end face of the connector housing 31, and has upper and lower inner surfaces parallel to each other.

[0040] As will be more fully described later, when the lance 34 holds the metal terminal 33, inserted into a proper position, against withdrawal, a lower surface of the lance 34 is disposed parallel to the lower inner surface of the lance flexing space 32a. The lower surface portion of the lance 34 projects downwardly into the upper inner surface of the lance flexing space 32a (Fig. 4).

[0041] When the metal terminal 33 is inserted into the cavity 32, the distal end of the metal terminal 33 abuts against the lance 34 during the insertion to urge the lance 34 downward, so that the lance 34 is elastically deformed and projected into the lance flexing space 32a. When the metal terminal 33 is inserted into an innermost portion of the cavity 32, the lance 34, elastically deformed during the insertion, is retracted upwardly from the lance flexing space 32a, that is, restored to its initial position as a result of engagement of the retaining portion 34a in an engagement hole 43a in the metal terminal 33, thereby retaining the metal terminal 33 against withdrawal.

[0042] To indicate the condition of engagement of the lance 34, the metal terminal 33 in the upper stage (Fig. 3) is shown as inserted into a proper position to be completely engaged with the lance 34, while the metal terminal 33 in the lower stage is shown as disposed in an incompletely-inserted position short of the properly position, with the lance 34 elastically deformed into the lance flexing space 32a.

[0043] Next, an examination device 10 for examining the above connector 30 will be described. The examination device 10 is incorporated in an inspection or checker housing 11 made of a resin. The interior of the inspection housing 11 is divided by partition walls 11a into a plurality of smaller chambers forming cavities 12 corresponding in number to the cavities 32 in the connector housing 31. The inspection housing has a hood portion 13 of a generally square or rectangular shape disposed adjacent to front ends of the cavities 12, the hood portion 13 serving as a set portion for receiving the connector housing 31 of the connector 30.

[0044] A slider 14, having excellent sliding properties, is mounted within each cavity 12 for sliding movement therealong, and a lance check pin 15, formed integrally with the slider, projects into the hood portion 13 through a through hole IIb formed in the partition wall IIa. A relatively weak compression spring 16 mounted within the cavity 12 normally urges the slider 14 to a right side in Fig. 1. When the connector 30 is not placed in the hood portion 13, the lance check pin 15 fully projects into the hood portion 13 in such a manner that a stopper 14a, formed on the slider 14 in a projected manner, abuts against the partition wall IIa. The lance check pin 15 is disposed in such a position that it can be inserted into the lance flexing space 32a in the connector housing 31 set in the hood portion 13.

[0045] The lance check pin 15, when inserted into the lance flexing space 32a, moves in sliding contact with the upper and lower inner surfaces of the lance flexing space. Even when the lance 34 retains the metal terminal 33 against movement from the normal position, the lance 34 slightly projects into the lance flexing space 32a as described above. In this connection, a distal end

portion 15a of the lance check pin 15 is cut at its upper surface to be reduced in thickness. Therefore, the lance check pin 15 can be inserted into a position where its distal end portion 15a underlies the lance 34. With this construction, when the metal terminal 33 is disposed in an incompletely-inserted position, with the lance 34 flexed and projection into the lance flexing space 32a, the distal end of the lance check pin 15 abuts against the distal end of the lance 34.

[0046] According to the invention the lance check pin 15 is provided with means by which its distal end portion 15a can be smoothly brought into underlying relation to the lance 34. This construction will now be described.

[0047] Elongate, wall-like guide portions 15b and 15b are respectively formed on and extend along lateral marginal portions (except for a widthwise central portion registrable with the lance 34) of the upper surface of the distal end portion 15a of the lance check pin 15 that can face the lower surface of the lance 34. The guide portions 15b extend parallel to the direction of the length of the lance check pin 15. Upper surfaces of the guide portions 15b are flush and continuous with the upper surface of that portion of the lance check pin 15 extending rearwardly from the distal end portion thereof, and can be brought into contact with the upper inner surfaces of the lance flexing space 32a.

[0048] Distal ends of the guide portions 15b terminate a predetermined distance short of the distal end of the lance check pin 15 to provide a relief recess 15c for preventing the guide portions 15b from interfering with stabilizers 33a that project from the metal terminal 33 along the opposite sides of the lance 34.

[0049] An electrical contact member 17, comprising an electrically-conductive bar, is fixedly mounted on the slider 14, for example, by press-fitting. The electrical contact member 17 extends parallel to the lance check pin 15, and a length of the contact member 17 is shorter than that of the lance check pin 15. The position of the distal end of the electrical contact portion 17 is so determined that when the connector housing 31 is set in the hood portion 13, so that the distal end portion 15a of the lance check pin 15 is brought into underlying relation to the lance 34, with the metal terminal 33 disposed in the proper position, the electrical contact member 17 contacts the distal end of the metal terminal 33.

[0050] Each of the electrical contact members 17 is connected to a conduction examination circuit (not shown) via a lead wire 18. This conduction examination circuit judges whether the metal terminals 33 are properly inserted respectively into the cavities 32 in the connector 30 assembled as a wire harness. The conduction examination circuit is a known construction and incorporates a power source for conduction examination purposes, and effects an examination by judging whether electric current can flow between predetermined metal terminals of the two connectors connected respectively to the opposite ends of the wire harness.

[0051] Next, the operation of this embodiment will be described. The metal terminals 33, compressively connected to respective ends of the wires 35, are inserted respectively into their associated cavities 32 in the connector housing 31, and the wires 35 are combined together into a bundle by tape or the like, thereby assembling the wire harness. In this condition, the examination for improper attachment of the metal terminals 33, as well as conduction examination, are carried out in the following manner. The wire harness to be examined is placed on a predetermined examination plate, and the connector 30 is set in the hood portion 13 of the inspection housing 11 of the connector examination device 10 (see Fig. 3).

[0052] At this time, if the metal terminal 33 of the connector 30 is disposed in the proper position where it is engaged with the lance 34 of the connector housing 31 as shown in the upper stage of Fig. 3, the lance 34 is retracted upwardly, and projects slightly into the lance flexing space 32a, thereby opening the lance flexing space 32a disposed below the lance 34. Therefore, the lance check pin 15, inserted into the lance flexing space 32a upon setting of the connector 30, will not abut against the lance 34, and the distal end portion 15a of the lance check pin 15 is brought into underlying relation to the lance 34, with the two guide portions 15b and 15b disposed adjacent respectively to the opposite lateral sides of the lance 34.

[0053] As a result, by the urging force of the spring 16, the slider 14 is moved forward in such a manner that the lance check pin 15 is fully projected into the hood portion 13 of the checker housing 11. As a result, the electrical contact member 17, movable with the slider 14, is also projected a maximum distance toward the connector 30, so that the distal end of the contact member is brought into contact with the distal end of the metal terminal 33, thus making an electrical connection therebetween. Therefore, it is confirmed by the conduction examination circuit that the metal terminal 33 is disposed in the proper position and that the metal terminal is mounted in the predetermined cavity 32.

[0054] By contrast, if the metal terminal 33 is disposed in an incompletely-inserted position where it does not contact the lance 34, as shown in the lower stage of Fig. 3, the lance 34 is pressed down by this metal terminal 33, and projects into the lance flexing space 32a. Therefore, when the connector 30 is set in the hood portion 13 of the checker housing 11, the distal end portion 15a of the lance check pin 15 abuts against the distal end of the lance 34, and can not be brought into underlying relation with respect to the lance 34.

[0055] Therefore, during the setting of the connector 30, the lance check pin 15 is prevented from advancing in the lance flexing space 32a, and the slider 14 is urged left (Fig. 3) relative to the checker housing 11 while compressing the compression spring 16. Therefore, the electrical contact member 17, integrally mounted on the slider 14, is also urged left, and can not contact the metal terminal 33, thus failing to achieve an electrical connec-

tion to the metal terminal 33. This abnormality encountered with the metal terminal 33 is detected by the conduction examination circuit.

[0056] When the lance 34 is urged down into the lance flexing space 32a as described above, the distal end of the lance check pin 15 abuts against the lance 34, and therefore an insertion resistance, produced when setting the connector 30 into the hood portion 13 of the checker housing 11, is increased. Despite this, the setting should be continued. Because the lance check pin 15 is urged left while compressing the compression spring 16, an excessive pressure will not be exerted on the lance 34, and damage to the lance 34 is thereby prevented.

[0057] In the above examination, there are occasions when the distal end portion 15a of the lance check pin 15 to be inserted into the lance flexing space 32a in the connector 30 is deformed or bent upwardly, or is obliquely and/or upwardly inserted into the lance flexing space 32a. Even in such a case, upon insertion of the lance check pin 15 into the lance flexing space 32a, the upper surfaces of the guide portions 15b contact the upper inner surface of the lance flexing space 32a over a predetermined length in the direction of the length of the lance check pin 15. In addition the lower surface of the lance check pin 15 contacts the lower inner surface of the lance flexing space 32a. Therefore, the lance check pin 15 is corrected into a proper posture, and can be inserted into the lance flexing space 32a while being guided by guide portions 15b to this posture.

[0058] As described above according to the invention, when the metal terminal 33 is disposed in the proper position, the distal end portion 15a of the lance check pin 15 can be positively brought into the position beneath the lance 34. Therefore, to misjudge that the metal terminal 33 is disposed in an incompletely-inserted position, although the metal terminal is actually disposed in the proper position, is prevented, and the highly-reliable examination can be carried out.

[0059] In addition, the relief recess 15c is provided at the distal end portion 15a of the lance check pin 15, and when the distal end portion 15a of the lance check pin 15 is brought into underlying relation to the lance 34, the guide portions 15b of the lance check pin 15 will not interfere with the stabilizers 33a of the metal terminal 33, thereby preventing a situation in which the advance of the lance check pin 15 is prevented by the interference of the guide portions 15b with the stabilizers 33a.

[0060] The electrical contact members 17 can be connected to the conduction examination circuit for the wire harness, and by performing one operation, that is, the setting of the connector 30 in the inspection housing 11, the position of the lance 34 (that is, whether each metal terminal 33 is disposed in the proper position) and whether each metal terminal 33 is mounted in the predetermined cavity 32 can be confirmed at the same time, and the examination operation is made reliable and efficient.

[0061] Furthermore, the sliders 14 are mounted respectively in the cavities 12 in the inspection housing 11, and the lance check pin 15 and the electrical contact member 17 are integrally provided on each slider to provide a single unit. Therefore, it is only necessary to provide units corresponding in number to the number of poles of the connector 30 to be examined. The integral check pin and electrical contact member 17 can be adapted for inspection of any type of connector. In the event of a malfunction, it is only necessary to exchange such a defective unit, and therefore the maintainability is excellent.

[0062] Fig. 6 shows a second embodiment of the terminal inspecting apparatus and method aspects of the present invention. The basic difference from the above embodiment is that this embodiment is of such a construction that an inspection housing 11 is mechanically moved toward a connector 30. Other elements are similar to those of the first embodiment and, therefore, to avoid repeated explanation, identical portions are denoted by the same reference numerals, respectively, and only different portions will be described in detail.

[0063] The inspection housing 11 is mounted on a base plate 41 for movement to the right and left in Fig. 6, and is moved by pivotally rotating a cam handle 42 about a shaft 42a mounted on the base plate 41. Lance check pins 15 and electrical contact members 17 used in this embodiment are the same as those in the preceding embodiment.

[0064] A connector holder 43 is fixedly mounted on a left end portion (Fig. 6) of the base plate 41. The connector holder 43 comprises a U-shaped support block 44, a U-shaped back plate 45 releasably mounted on the support block 44, and an upwardly-open connector fixing groove 46 is provided between the support block and the back plate. Elongate protuberances (not shown) formed on an outer surface of the connector housing 31 are fitted in the connector fixing groove 46 from the upper side, and the two elongate protuberances are vertically guided by it, so that the connector housing 31 received by the support block 44 is retained in position. In this condition, the connector housing 31 is immovable in right and left directions.

[0065] The connector 30, manually or by machine, is fitted or set in the connector holder 43 from the upper side. When the cam handle 42 is pivotally moved in a direction of an arrow 70 to move the inspection housing 11 to the right in Fig. 6, each of the lance check pins 15 and the associated electrical contact members 17 are moved toward the connector 30, and the distal end portion of the lance check pin 15 is inserted into a lance flexing space 32a beneath a lance 34. The electrical contact member 17 is moved toward an associated metal terminal 33, as described above for the preceding embodiment. As a result, the condition of attachment of each metal terminal 33, as well as the connection of the metal terminal 33, is checked.

[0066] According to the invention, in this embodiment,

also, guide portions 15b for keeping the lance check pin 15 in a proper position in the lance flexing space 32a are formed at a distal end portion 15a of the lance check pin 15. Therefore, when the metal terminal 33 is disposed in a proper position, the distal end portion 15a of the lance check pin 15 can be positively brought into a position beneath the lance 34. This eliminates the possibility that it is judged that the metal terminal is disposed in an incompletely-inserted position when the metal terminal 33 is disposed in the proper position, and therefore highly reliable examination can be carried out.

[0067] In Fig. 6, the inspection housing 11 is moved by pivotally moving the cam handle 42; however, in contrast with this, the checker housing 11 may be fixed while the connector holder 43 holding the connector 30 may be moved, or the two may be moved toward each other.

[0068] In addition, the judgment means for judging from the position of the lance check pin 15 may be achieved using devices other than the electrical contact member 17 that is mounted for movement with the lance check pin 15.

Claims

1. A connector examination device (10) for examining a connector (30) having metal terminals (33) inserted into cavities (32) formed in a connector housing (31), and lances (34) formed in the connector housing (31) that are elastically deformed into lance flexing spaces (32a) upon insertion of the metal terminals (33), said lances (34) being restored to engage said metal terminals (33) when said metal terminals (33) are brought into a properly-attached condition, to retain said metal terminals (33) against withdrawal, said device (10) comprising:

   an inspection housing (11) having a setting portion for receiving the connector (30) to be examined;
   lance check pins (15) insertable into said lance flexing spaces (32a), said lance check pins (15), upon insertion, abutting against the lances (34) when the metal terminals (33) are in an improperly-attached condition,
   sliders (14) mounted on said inspection housing (11) for movement toward and away from the connector (30); and
   a judgment means (17, 18) which is mounted on each of said sliders (14), wherein each of said judgment means (17, 18) comprises an electrical contact member (17) being connected to a conduction examination circuit for a wire harness; wherein
   each of said lance check pins (15) has at least one guide portion (15b) for contacting an inner surface of each of said lance flexing spaces (32a) so as to keep said lance check pins (15) in a proper orientation in said lance flexing spaces (32a);
   said electrical contact members (17) are mounted for movement with the lance check pins (15) so as to engage the metal terminal (33) received and retained in the properly-attached conditions in the connector housing (31) against withdrawal, and in that
   said judgment means (17, 18) are for judging from a position of the lance check pins (15) whether the lance check pins (15) are abutted against the lances (34).

2. A connector examination device according to claim 1, wherein said lance check pin (15) has a relief recess (15c) for preventing said at least one guide portion (15b) from interfering with stabilizers (33a) extending from the metal terminal (33) on opposite sides of said lance (34).

3. A connector examination device according to claim 1 or 2, said device further comprising:

   a connector holder (43) for holding the connector (30) to be examined, wherein the inspection housing (11) is provided in opposed relation to said connector holder (43); and
   a drive mechanism for moving at least one of said connector holder (43) and said inspection housing (11) toward the other.

4. A device (10) for inspecting a terminal (33) inserted within a connector housing (31), said connector housing (31) having a lance (34) capable of securing the terminal (33) in a locking position and a lance flexing space (32a) into which the lance (34) flexibly extends as the terminal (33) is inserted within the connector housing (31), said device comprising:

   a lance check pin (15) that is inserted in the lance flexing space (32a); wherein
   a means (15b) is provided on the lance check pin (15) for guiding the tip portion (15a) of the lance check pin (15) to a first position below the lance (34) when the lance (34) is disposed in the locking position, even when the lance (34) partially protrudes within the lance flexing space (32a) and the tip portion (15a) is at least one of irregularly formed and obliquely inserted.

5. The device of claim 4, wherein said lance check pin (15) is operatively connected to an electrical contact member (17) that contacts said terminal (33) when the terminal (33) is in the locking position, and does not contact the terminal (33) when the terminal (33) is in an unlocked position wherein the tip portion (15a) of the lance check pin (15) engages an end

portion of the lance (34) disposed in the lance flexing space (32a).

6. The device of claim 5, wherein the lance check pin (15) and the electrical contact member (17) are connected to a slider (14) to form an inspection unit provided within an examination device.

7. The device of claim 6, wherein the inspection unit slides within said inspection device against the bias of a spring (16) when the tip portion (15a) of the lance check pin (15) engages said end portion of said lance (34) and the terminal (33) is in the unlocked position, whereby the electrical contact portion does not contact the terminal (33).

8. The device of claim 7, wherein the electrical contact member (17) is connected to a circuit for signaling the locking position and the unlocked position.

9. The device of claim 4, further comprising a first support (43) provided for the connector housing (31) and a second support (11) provided for the lance check pin (15), wherein the first and second supports are moved into engagement with each other to inspect the position of the terminal (33).

10. The device of claim 9, wherein one of the first and second supports is provided with a crank (42) that reciprocates the connector housing (31) back and forth with respect to the lance check pin (15).

11. The device of claim 4, wherein the means for guiding includes at least one guide portion (15b) provided near the tip portion (15a) of the lance check pin (15).

12. The device of claim 4, wherein the guiding means comprises two guide portions (15b, 15c) that straddle the lance (34) and define a recess that provides a space in which stabilizers (33a) formed on the terminals (33) can be disposed.

13. A method for inspecting a terminal (33) inserted within a connector housing (31), the connector housing (31) having a lance (34) capable of securing the terminal (33) in a locking position and a lance flexing space (32a) into which the lance (34) flexibly extends as the terminal (33) is inserted within the connector housing (31), the method comprising:

inserting a lance check pin (15) into the lance flexing space (32a);

characterized by the step:

guiding a tip portion (15a) of the lance check pin (15) to a first position below the lance (34) when the lance (34) is disposed in the locking position, even when the lance (34) partially protrudes within the lance flexing space (32a) and the tip portion (15a) is at least one of irregularly formed and obliguely inserted.

14. The method of claim 13, wherein the tip portion (15a) includes at least one guide portion (15b) that ensures said tip portion (15a) is guidable to said first position when the lance (34) is in the locking position.

15. The method of claim 14, wherein the at least one guide portion includes two spaced guide portions, the method including straddling the lance (34) with the spaced guide portions when the lance check pin (15) is in the first position.

16. The method of claim 15, wherein the tip portion (15a) further includes a relief recess (15c) disposed between the two spaced guide portions and further toward a distal end of the tip portion (15a) than the two guide portions, the relief portion providing a space between the terminal (33) and the tip portion (15a) in which stabilizers (33a) formed on the terminals (33) are disposed.

17. The method of claim 13, further comprising indicating one of said locking position and an unlocked position, said unlocked position being indicated when said tip portion (15a) of said lance check pin (15) engages an end portion of said lance (34) disposed within the lance flexing space (32a).

18. The method of claim 17, wherein said indicating includes operatively connecting said lance check pin (15) to an electrical contact member (17) that contacts said terminal (33) when the terminal (33) is in the locking position, and does not contact the terminal (33) when the terminal (33) is in the unlocked position.

19. The method of claim 18, wherein the indicating includes connecting the lance check pin (15) and the electrical contact member (17) to a slider (14), thus forming an inspection unit provided within an examination device.

20. The method of claim 19, wherein the indicating includes sliding the inspection unit within said examination device against the bias of a spring (16) during the inserting when the tip portion (15a) of the lance check pin (15) engages said end portion of said lance (34) and the terminal (33) is in the unlocked position, whereby the electrical contact portion does not contact the terminal (33).

21. The method of claim 18, wherein the indicating in-

cludes connecting the electrical contact member (17) to a circuit for signaling the locking position and the unlocked position.

22. The method of claim 13, further comprising providing the connector housing (31) on a first support (43), providing the lance check pin (15) on a second support (11), and moving the first and second supports toward each other to inspect the position of the terminal (33).

23. The method of claim 22, further comprising providing one of the first and second supports with a crank (42), and using the crank (42) to reciprocate the connector housing (31) back and forth with respect to the lance check pin (15).

Patentansprüche

1. Verbinderprüfvorrichtung (10) zur Überprüfung eines Verbinders (30) mit metallischen Anschlüssen (33), die in Hohlräumen (32) eingefügt sind, welche in einem Verbindergehäuse (31) ausgebildet sind, und Lanzen (34), die im Verbindergehäuse (31) ausgebildet sind und bei der Einfügung der metallischen Anschlüsse (33) elastisch in Lanzenbiegefreiräume (32a) verformt werden, wobei die Lanzen (34) zurückgestellt werden, um mit den metallischen Anschlüssen (33) in Eingriff zu gelangen, wenn die metallischen Anschlüsse (33) in einen korrekt angebrachten Zustand gebracht sind, um die metallischen Anschlüsse (33) gegen ein Herausziehen zu halten, wobei die Vorrichtung (10) enthält:

   ein Prüfgehäuse (11) mit einem Festsetzabschnitt zur Aufnahme des zu überprüfenden Verbinders (30);

   Lanzenprüfstifte (15), welche in die Lanzenbiegefreiräume (32a) einfügbar sind, wobei die Lanzenprüfstifte (15) während der Einfügung gegen die Lanzen (34) stoßen, wenn die metallischen Anschlüsse (33) in einem unkorrekt angebrachten Zustand vorliegen,

   Gleitstücke (14), welche am Prüfgehäuse (11) zu einer Bewegung zum Verbinder (30) hin und weg davon montiert sind; und

   eine Beurteilungseinrichtung (17, 18), welche an jedem der Gleitstücke (14) montiert ist, wobei jede der Beurteilungseinrichtungen (17, 18) ein elektrisches Kontaktteil (17) enthält, welches mit einer Verbindungsprüfschaltung für einen Kabelbaum verbunden ist; wobei

   jeder der Lanzenprüfstifte (15) zumindest einen Führungsabschnitt (15b) zur Berührung einer inneren Fläche von jedem der Lanzenbiegefreiräume (32a) aufweist,

   um die Lanzenprüfstifte (15) in einer korrekten Orientierung in den Lanzenbiegefreiräumen (32a) zu halten;

   wobei die elektrischen Kontakteile (17) für eine Bewegung mit den Lanzenprüfstiften (15) montiert sind, um mit dem metallischen Anschluß (33) in Eingriff zu gelangen, der in korrekt angebrachten Zuständen in Verbindergehäuse (31) aufgenommen und gegen ein Herausziehen gehalten ist, und wobei

   die Beurteilungseinrichtung (17, 18) dazu dient, um aus einer Lage der Lanzenprüfstifte (15) zu beurteilen, ob die Lanzenprüfstifte (15) gegen die Lanzen (34) stoßen.

2. Verbinderprüfvorrichtung nach Anspruch 1, wobei der Lanzenprüfstift (15) einen vertieften Absatz (15c) zur Vermeidung einer Störung des wenigstens einen Führungsabschnitts (15b) durch Stabilisierer (33a) aufweist, welche sich vom metallischen Anschluß (33) an gegenüberliegenden Seiten der Lanze (34) erstrecken.

3. Verbinderprüfvorrichtung nach Anspruch 1 oder 2, wobei die Vorrichtung ferner enthält:

   einen Verbinderhalter (43) zum Halten des zu überprüfenden Verbinders (30), wobei das Prüfgehäuse (11) in gegenüberliegender Relation zum Verbinderhalter (43) vorgesehen ist; und
   einen Antriebsmechanismus zum Zueinanderbewegen des wenigstens einen Verbinderhalters (43) und des Prüfgehäuses (11).

4. Vorrichtung (10) zur Überprüfung eines Anschlusses (33), der in ein Verbindergehäuse (31) eingefügt ist, wobei das Verbindergehäuse (31) versehen ist mit einer Lanze (34), welche zur Sicherung des Anschlusses (33) in einer verriegelten Lage geeignet ist, und einem Lanzenbiegefreiraum (32a), in welchen sich die Lanze (34) flexibel erstreckt, wenn der Anschluß (33) in das Verbindergehäuse (31) eingefügt wird, wobei die Vorrichtung enthält:

   einen Lanzenprüfstift (15), der in den Lanzenbiegefreiraum (32a) eingefügt wird; wobei

   eine Einrichtung auf dem Lanzenprüfstift (15) zum Führen der Spitze (15a) des Lanzenprüfstifts (15) zu einer ersten Lage unterhalb der

Lanze (34) vorgesehen ist, wenn die Lanze (34) in der verriegelten Lage angeordnet ist, auch wenn die Lanze (34) teilweise in den Lanzenbiegefreiraum (32a) übersteht und die Spitze (15a) irregulär ausgebildet und/oder schräg eingefügt ist.

5. Vorrichtung nach Anspruch 4, wobei der Lanzenprüfstift (15) zusammenwirkend mit einem elektrischen Kontaktteil (17) verbunden ist, welches den Anschluß (33) kontaktiert, wenn der Anschluß (33) in der verriegelten Lage vorliegt, und den Anschluß (33) nicht kontaktiert, wenn der Anschluß (33) in einer unverriegelten Lage vorliegt, in der die Spitze (15a) des Lanzenprüfstifts (15) in einen Endabschnitt der Lanze (34) eingreift, der im Lanzenbiegefreiraum (32a) angeordnet ist.

6. Vorrichtung nach Anspruch 5, wobei der Lanzenprüfstift (15) und das elektrische Kontaktteil (17) mit einem Gleitstück (14) verbunden sind, um eine Prüfeinheit auszubilden, die in einer Prüfvorrichtung vorgesehen ist.

7. Vorrichtung nach Anspruch 6, wobei die Prüfeinheit innerhalb der Prüfvorrichtung gegen die Vorspannung einer Feder (16) gleitet, wenn die Spitze (15a) des Lanzenprüfstifts (15) in einen Endabschnitt der Lanze (34) eingreift und der Anschluß (33) in einer unverriegelten Lage ist, wodurch der elektrische Kontaktabschnitt den Anschluß (33) nicht kontaktiert.

8. Vorrichtung nach Anspruch 7, wobei das elektrische Kontaktteil (17) mit einer Schaltung zum Anzeigen der verriegelten Lage und der unverriegelten Lage verbunden ist.

9. Vorrichtung nach Anspruch 4, ferner mit einer ersten Abstützung (43), die für das Verbindergehäuse (31) vorgesehen ist, und einer zweiten Abstützung (11), die für den Lanzenprüfstift (15) vorgesehen ist, wobei die erste und zweite Abstützung in Eingriff miteinander bewegt werden, um die Lage der Anschlüsse (33) zu überprüfen.

10. Vorrichtung nach Anspruch 9, wobei die erste oder die zweite Abstützung mit einer Kulisse (42) versehen ist, welche das Verbindergehäuse (31) nach hinten und vorne bezüglich den Lanzenprüfstiften (15) hin und her bewegt.

11. Vorrichtung nach Anspruch 4, wobei die Einrichtung zum Führen wenigstens einen Führungsabschnitt (15b) enthält, der nahe der Spitze (15a) des Lanzenprüfstifts (15) vorgesehen ist.

12. Vorrichtung nach Anspruch 4, wobei die Führungseinrichtung zwei Führungsabschnitte (15b, 15c) enthält, welche die Lanze (34) übergreifen und eine Aussparung definieren, welche einen Freiraum schafft, in denen Stabilisierer (33a), welche auf den Anschlüssen (33) ausgebildet sind, angeordnet werden können.

13. Verfahren zur Überprüfung eines Anschlusses (33), der in ein Verbindergehäuse (31) eingefügt ist, wobei das Verbindergehäuse (31) versehen ist mit einer Lanze (34), die zur Sicherung des Anschlusses (33) in einer verriegelten Lage geeignet ist, und einem Lanzenbiegefreiraum (32a), in welchen sich die Lanze (34) flexibel erstreckt, wenn der Anschluß (33) in das Verbindergehäuse (31) eingefügt wird, wobei das Verfahren enthält:

Einfügen eines Lanzenprüfstifts (15) in den Lanzenbiegefreiraum (32a);

gekennzeichnet durch den Schritt:

Führen einer Spitze (15a) des Lanzenprüfstifts (15) durch eine Einrichtung (15b), die auf dem Lanzenprüfstift (15) vorgesehen ist, in eine erste Lage unterhalb der Lanze (34), wenn die Lanze (34) in der verriegelten Lage angeordnet ist, auch wenn die Lanze (34) teilweise in den Lanzenbiegefreiraum (32a) übersteht, und die Spitze (15a) irregulär ausgebildet und/oder schräg eingefügt ist.

14. Verfahren nach Anspruch 13, wobei die Spitze (15a) wenigstens einen Führungsabschnitt (15b) enthält, der sicherstellt, daß die Spitze (15a) zur ersten Lage führbar ist, wenn die Lanze (34) in der verriegelten Lage vorliegt.

15. Verfahren nach Anspruch 14, wobei der wenigstens eine Führungsabschnitt zwei beabstandete Führungsabschnitte enthält, und wobei das Verfahren das Überspannen der Lanze (34) mit den benachbarten Führungsabschnitten enthält, wenn der Lanzenprüfstift (15) in der ersten Lage ist.

16. Verfahren nach Anspruch 15, wobei die Spitze (15a) ferner einen vertieften Absatz (15c) enthält, der zwischen den beiden beabstandeten Führungsabschnitten angeordnet ist und näher am distalen Ende der Spitze (15a) als die beiden Führungsabschnitte vorliegt, wobei der vertiefte Absatz, einen Freiraum zwischen dem Anschluß (33) und der Spitze (15a) schafft, in welchem auf den Anschlüssen (33) ausgebildete Stabilisierer (33a) angeordnet sind.

17. Verfahren nach Anspruch 13, ferner mit einem Anzeigen einer verriegelten Lage oder einer unverrie-

gelten Lage, wobei die unverriegelte Lage angezeigt wird, wenn die Spitze (15a) des Lanzenprüfstifts (15) in Eingriff mit einem Endabschnitt der Lanze (34) gelangt, der im Lanzenbiegefreiraum (32a) angeordnet ist.

18. Verfahren nach Anspruch 17, wobei das Anzeigen das zusammenwirkende Verbinden des Lanzenprüfstifts (15) mit einem elektrischen Kontaktteil (17) enthält, welches den Anschluß (33) kontaktiert, wenn der Anschluß (33) in der verriegelten Lage vorliegt, und den Anschluß (33) nicht kontaktiert, wenn der Anschluß (33) in der unverriegelten Lage vorliegt.

19. Verfahren nach Anspruch 18, wobei das Anzeigen das Verbinden des Lanzenprüfstifts (15) und des elektrischen Kontaktteils (17) mit einem Gleitstück (14) enthält, wodurch somit eine Prüfeinheit ausgebildet wird, die in der Prüfvorrichtung vorgesehen ist.

20. Verfahren nach Anspruch 19, wobei das Anzeigen während der Einfügung das Gleiten der Prüfeinheit innerhalb der Prüfvorrichtung entgegen der Vorspannung einer Feder (16) enthält, wenn die Spitze (15a) des Lanzenprüfstifts (15) mit dem Endabschnitt der Lanze (34) in Eingriff gelangt, und der Anschluß (33) in der unverriegelten Lage vorliegt, wodurch der elektrische Kontaktabschnitt den Anschluß (33) nicht kontaktiert.

21. Verfahren nach Anspruch 18, wobei das Anzeigen das Verbinden des elektrischen Kontaktteiles (17) mit einer Schaltung zum Signalisieren der verriegelten Lage und der unverriegelten Lage enthält.

22. Verfahren nach Anspruch 13, ferner mit der Bereitstellung des Verbindergehäuses (31) auf einer ersten Abstützung (43), Bereitstellen des Lanzenprüfstifts (15) auf einer zweiten Abstützung (11), und aufeinander zu bewegen, der ersten und zweiten Abstützung zur Prüfung der Lage des Anschlusses (33).

23. Verfahren nach Anspruch 22, ferner mit der Bereitstellung der ersten oder zweiten Abstützung mit einer Kulisse (42), und der Verwendung der Kulisse (42) zur Hin- und Herbewegung des Verbindergehäuses (31) nach hinten und vorne hinsichtlich des Lanzenprüfstifts (15).

Revendications

1. Un dispositif pour l'examen d'un connecteur (10) pour examiner un connecteur (30) ayant des terminaux métalliques (33) insérés dans des cavités (32) formées dans un boîtier de connecteur (31), et des lances (34) formées dans le boîtier de connecteur (31) qui sont élastiquement déformées en espaces de flexion de lance (32a) en cas d'insertion des terminaux métalliques (33), lesdites lances (34) étant remises à l'état initial pour engager lesdits terminaux métalliques (33) quand lesdits terminaux métalliques (33) sont amenés dans une condition de position correcte pour retenir lesdits terminaux métalliques et empêcher leur retrait, ledit dispositif comprenant:

un boîtier d'inspection (11) ayant une portion d'emboîtement pour recevoir le connecteur (30) à être examiné;
des épingles de contrôle de lance (15) pouvant être insérées dans lesdits espaces de flexion de lance (32a), lesdites épingles de contrôle de lance (15) butant en cas d'insertion contre les lances (34) quand les terminaux métalliques (33) sont dans une condition de position correcte,
des coulisseaux montés sur ledit boîtier d'inspection (11) pour un mouvement vers le connecteur (30) et dans la direction inverse; et
un moyen de jugement (17, 18) qui est monté sur chacun desdits coulisseaux (14), dans lequel chacun desdits moyens de jugement (17, 18) comprend un membre de contact électrique (17) étant connecté à un circuit de contrôle de conduction pour un harnais de câble; dans lequel chacune desdites épingles de contrôle de lance (15) a au moins une portion de guidage (15b) pour contacter une surface intérieure de chacun desdits espaces de flexion de lance (32a) de manière à tenir lesdites épingles de contrôle de lance (15) dans une orientation correcte dans lesdits espaces de flexion de lance (32a);
lesdits membres de contact électrique (17) sont montés pour un mouvement avec les épingles de contrôle de lance (15) de manière à engager le terminal métallique reçu et retenu pour empêcher le retrait dans les conditions de position correcte dans le boîtier de connecteur (31), et en ce que
lesdits moyens de jugement (17, 18) sont pour juger à partir d'une position des épingles de contrôle de lance (15), si les épingles de contrôle de lance sont butées contre les lances (34).

2. Un dispositif pour l'examen d'un connecteur selon la revendication 1, dans lequel ladite épingle de contrôle de lance (15) a un creux de dégagement (15c) pour empêcher ladite au moins une portion de guidage (15b) d'interférer avec des stabilisateurs (33a) s'étendant du terminal métallique (33) sur des

côtés opposés de ladite lance (34).

3. Un dispositif pour l'examen d'un connecteur selon la revendication 1 ou 2, ledit dispositif comprenant de plus:

un teneur de connecteur (43) pour tenir le connecteur (30) à être examiné, dans lequel le boîtier d'inspection (11) est prévu dans un rapport opposé audit teneur de connecteur (43); et
un mécanisme d'entraînement pour déplacer au moins un dudit teneur de connecteur (43) et dudit boîtier d'inspection (11) vers l'autre.

4. Un dispositif (10) pour inspecter un terminal (33) inséré dans un boîtier de connecteur (31), ledit boîtier de connecteur (31) ayant une lance capable de fixer le terminal (33) dans une position de verrouillage et un espace de flexion de lance (32a) dans lequel la lance (34) s'étend flexiblement si le terminal (33) est inséré dans le boitier de connecteur (31), ledit dispositif comprenant:

une épingle de contrôle de lance (15) qui est insérée dans l'espace de flexion de lance (32a); dans lequel un moyen (15b) est prévu sur l'épingle de contrôle de lance (15) pour guider la portion d'extrémité (15a) de l'épingle de contrôle de lance (15) à une première position au-dessous de la lance (34) quand la lance (34) est disposée dans la position de verrouillage, même quand la lance (34) fait partiellement saillie à l'intérieur de l'espace de flexion de lance (32a) et la portion d'extrémité (15a) est au moins une, irrégulièrement formée et insérée obliquement.

5. Le dispositif selon la revendication 4, dans lequel ladite épingle de contrôle de lance (15) est d'une manière opérationnelle connectée à un membre de contact électrique (17) qui contacte ledit terminal (33) quand le terminal (33) est dans la position de verrouillage, et ne contacte pas le terminal (33) quand le terminal (33) est dans une (33) est dans la position de verrouillage, et ne contacte pas le terminal (33) quand le terminal (33) est dans une position non-verrouillée dans laquelle la portion d'extrémité (15a) de l'épingle de contrôle de lance (15) s'engage avec une portion d'extrémité de la lance (34) disposée dans l'espace de flexion de lance (32a).

6. Le dispositif selon la revendication 5, dans lequel l'épingle de contrôle de lance (15) et le membre de contact électrique (17) sont connectés à un coulisseau (14) pour former une unité d'inspection, prévue à l'intérieur d'un dispositif d'examen.

7. Le dispositif selon la revendication 6, dans lequel l'unité d'inspection glisse à l'intérieur dudit dispositif d'inspection contre le biais d'un ressort (16) quand la portion d'extrémité (15a) de l'épingle de contrôle de lance (15) s'engage avec ladite portion d'extrémité de ladite lance (34) et le terminal (33) est dans la position non-verrouillée, la portion de contact électrique ne point contactant le terminal (33).

8. Le dispositif selon la revendication 7, dans lequel le membre de contact électrique (17) est connecté à un circuit pour signaler la position de verrouillage et la position non-verrouillée.

9. Le dispositif selon la revendication 4, comprenant de plus un premier appui (43) prévu pour le boîtier de connecteur (31) et un second appui (11) prévu pour l'épingle de contrôle de lance (15), dans lequel les premier et second appuis sont déplacés pour s'engager l'un avec l'autre pour inspecter la position du terminal (33).

10. Le dispositif selon la revendication 9, dans lequel un des premier et second appuis est muni d'une manivelle (42) qui actionne d'un mouvement alternatif le boîtier du connecteur (31) en arrière et en avant par rapport à l'épingle de contrôle de lance (15).

11. Le dispositif selon la revendication 4, dans lequel le moyen de guidage comprend au moins une portion de guidage (15b) prévue à proximité de la portion d'extrémité de l'épingle de contrôle de lance (15).

12. Le dispositif selon la revendication 4, dans lequel le moyen de guidage comprend deux portions de guidage (15b, 15c) qui enjambent la lance (34) et définissent un creux qui prévoit un espace dans lequel des stabilisateurs (33a) formés sur les terminaux peuvent être disposés.

13. Un procédé pour inspecter un terminal (33) inséré à l'intérieur d'un boîtier de connecteur (31), le boitier de connecteur (31) ayant une lance (34) capable de fixer le terminal (33) dans une position de verrouillage et un espace de flexion de lance (32a) dans lequel la lance s'étend flexiblement quand le terminal (33) est inséré à l'intérieur du boitier de connecteur (31), le procédé comprenant :

insérer l'épingle de contrôle de lance (15) dans l'espace de flexion de lance (32a);

caractérisé par le pas de :

guider une portion d'extrémité (15a) de l'épingle de contrôle de lance (15) par un moyen (15b) prévu sur l'épingle de contrôle de lance

(15) à une première position au-dessous de la lance (34) quand la lance (34) est disposée dans la position de verrouillage, même quand la lance (34) fait partiellement saillie à l'intérieur de l'espace de flexion de lance (32a) et la portion d'extrémité (15a) est au moins une, irrégulièrement formée et obliquement insérée.

14. Le procédé selon la revendication 13, dans lequel la portion d'extrémité (15a) comprend au moins une portion de guidage (15b) qui assure que ladite portion d'extrémité (15a) peut être guidée à ladite première position quand la lance (34) est dans la position de verrouillage.

15. Le procédé selon la revendication 14, dans lequel la au moins une portion de guidage comprend deux portions de guidage espacées, le procédé comprenant enjamber la lance (34) avec les portions de guidage espacées quand l'épingle de contrôle de lance (15) est dans la première position.

16. Le procédé selon la revendication 15, dans lequel la portion d'extrémité (15a) comprend de plus un creux de dégagement (15c) disposé entre les deux portions de guidage espacées et plus vers une extrémité distale de la portion d'extrémité (15a) que les deux portions de guidage, la portion de dégagement prévoyant un espace entre le terminal (33) et la portion d'extrémité (15a) dans lequel des stabilisateurs (33a) formés sur les terminaux (33) sont disposés.

17. Le procédé selon la revendication 13, comprenant de plus indiquer une desdites position de verrouillage et position non-verrouillée, ladite position non-verrouillée étant indiquée, quand ladite portion d'extrémité (15a) de ladite épingle de contrôle de lance (15) s'engage avec une portion d'extrémité de ladite lance (34) disposée à l'intérieur de l'espace de flexion de lance (32a).

18. Le procédé selon la revendication 17, dans lequel indiquer comprend connecter d'une manière opérationnelle ladite épingle de contrôle de lance (15) à un membre de contact électrique (17) qui contacte ledit terminal (33) quand le terminal (33) est dans la position de verrouillage et ne contacte pas le terminal (33) quand le terminal est dans la position non-verrouillée.

19. Le procédé selon la revendication 18, dans lequel indiquer comprend connecter l'épingle de contrôle de lance (15) et le membre de contact électrique (17) à un coulisseau (14), formant ainsi une unité d'inspection prévue à l'intérieur d'un dispositif d'examen.

20. Le dispositif selon la revendication 19, dans lequel indiquer comprend glisser l'unité d'inspection à l'intérieur dudit dispositif d'examen contre le biais d'un ressort (16) pendant l'insertion quand la portion d'extrémité (15a) de l'épingle de contrôle de lance (15) s'engage avec ladite portion d'extrémité de ladite lance (34) et le terminal (33) est dans la position non-verrouillée, la portion de contact électrique ne contactant pas le terminal (33).

21. Le procédé selon la revendication 18, dans lequel indiquer comprend connecter le membre de contact électrique (17) à un circuit pour signaler la position de verrouillage et la position de non-verrouillée.

22. Le procédé selon la revendication 13 comprenant de plus prévoir un boîtier de connecteur (31) sur un premier appui (43), prévoir l'épingle de contrôle de lance (15) sur un second appui (11), et déplacer les premier et second appuis l'un vers l'autre pour inspecter la position du terminal (33).

23. Le procédé selon la revendication 22, comprenant de plus munir un des premier et second appuis d'une manivelle (42), et utiliser la manivelle (42) pour actionner d'un mouvement alternatif le boîtier de connecteur (31) en arrière et en avant par rapport à l'épingle de contrôle de lance (15).

FIG. 1

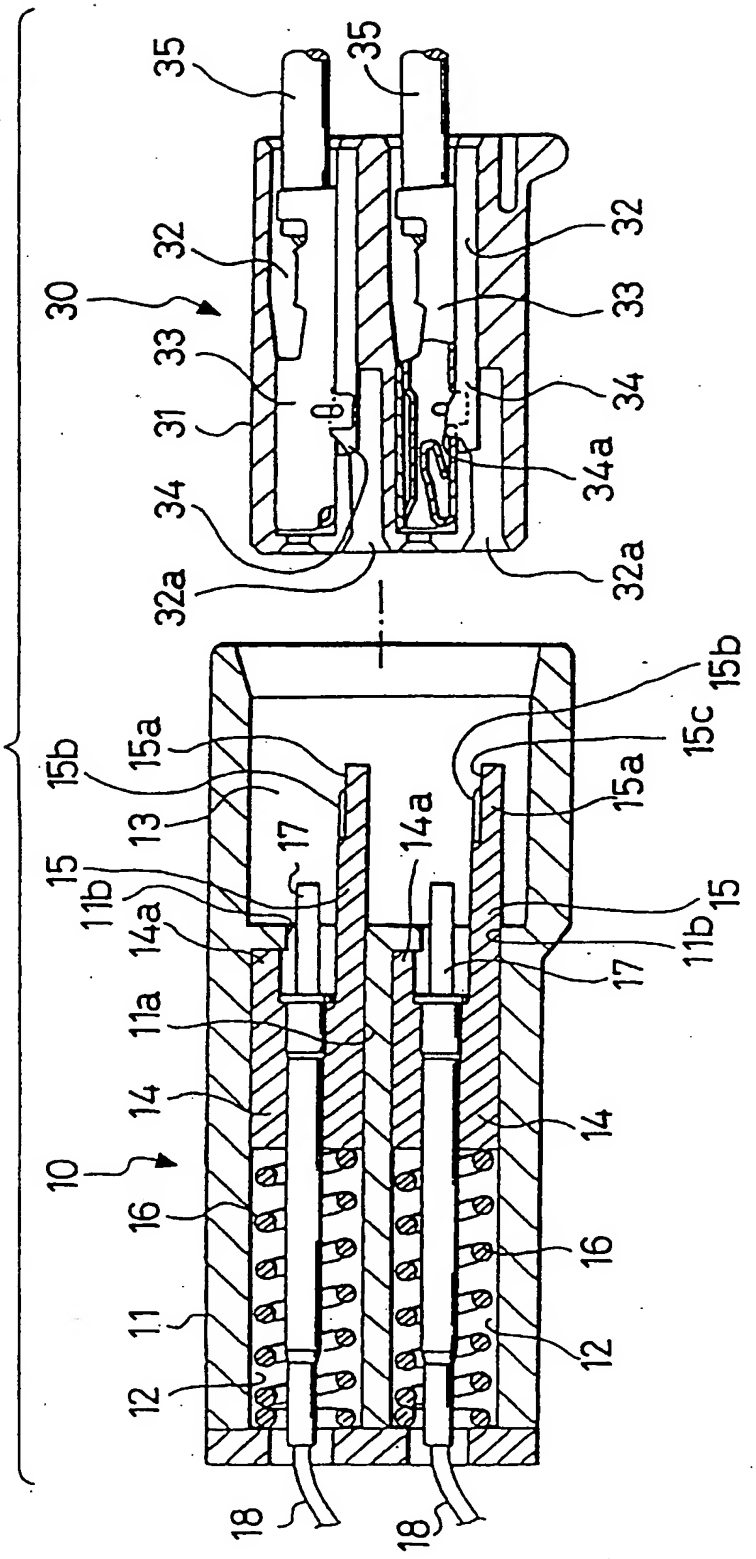

35
35
32
32
30
33
33
31
34
34
34a
32a
32a
15b
15a
15c
15b
13
15a
17
14a
15
11b
15
14a
11b
17
11a
14
14
10
16
16
11
12
12
18
18

FIG. 2

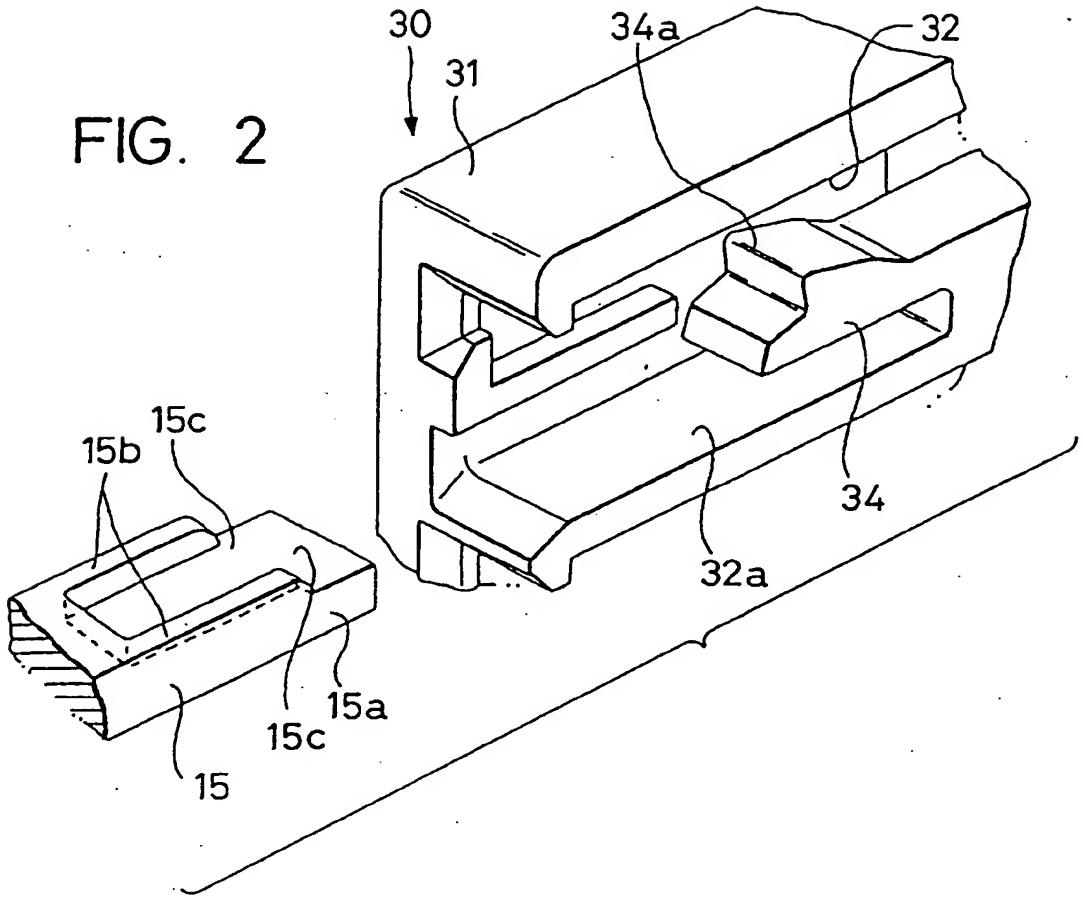
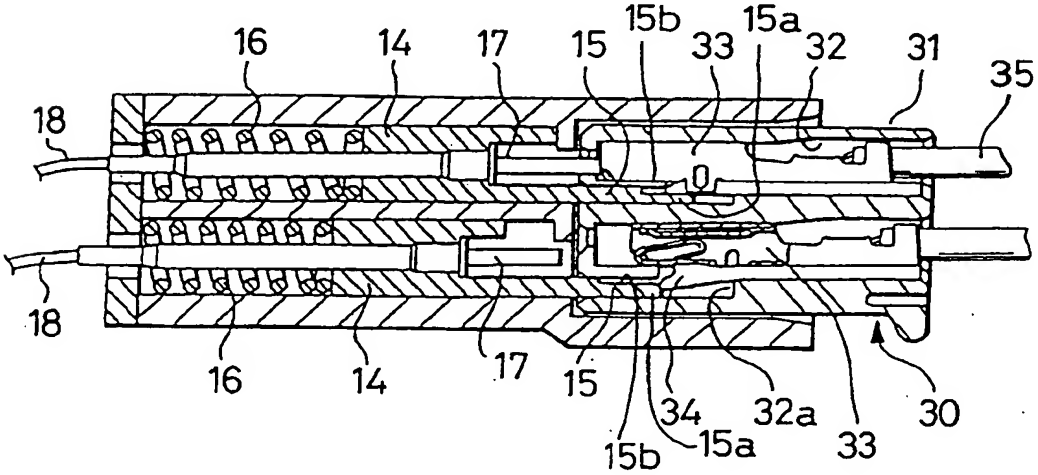

30
31
34a
32
15b
15c
34
32a
15c
15a
15

FIG. 3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14
17
15
15b
33
15a
32
31
35
18
18
16
14
17
15
34
32a
33
30
15b
15a

FIG. 4

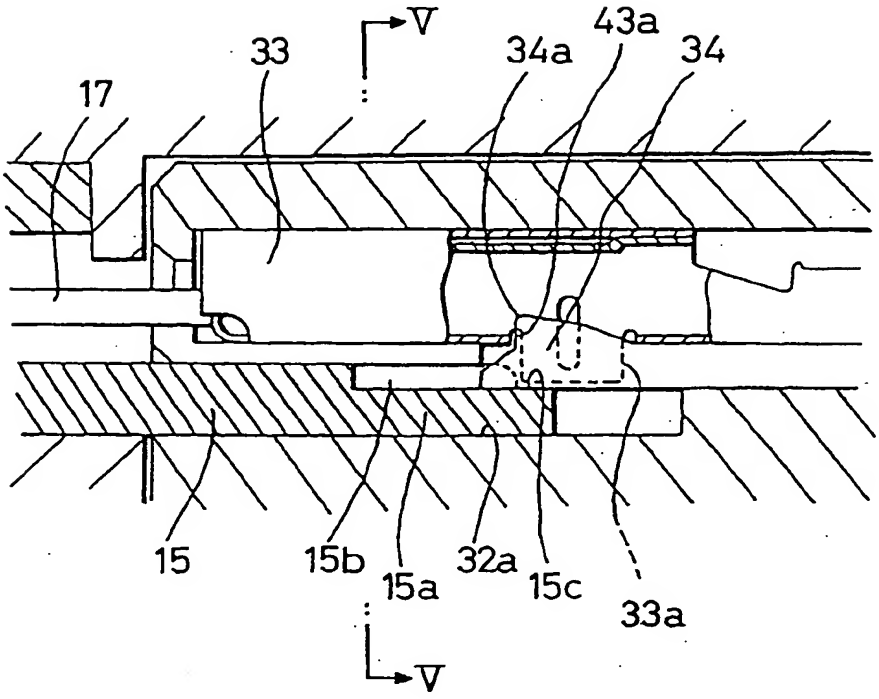
V
33
34a
43a
34
17
15
15b
15a
32a
15c
33a
V

FIG. 5

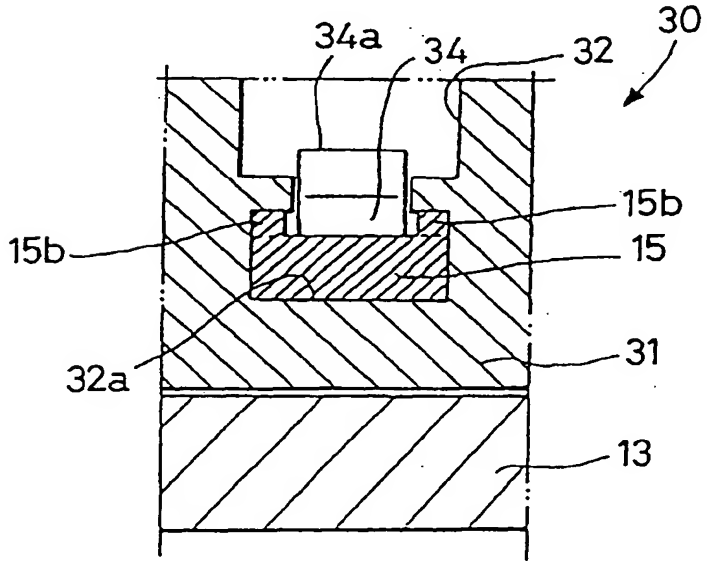
34a
34
32
30
15b
15b
15
31
32a
13

FIG. 6

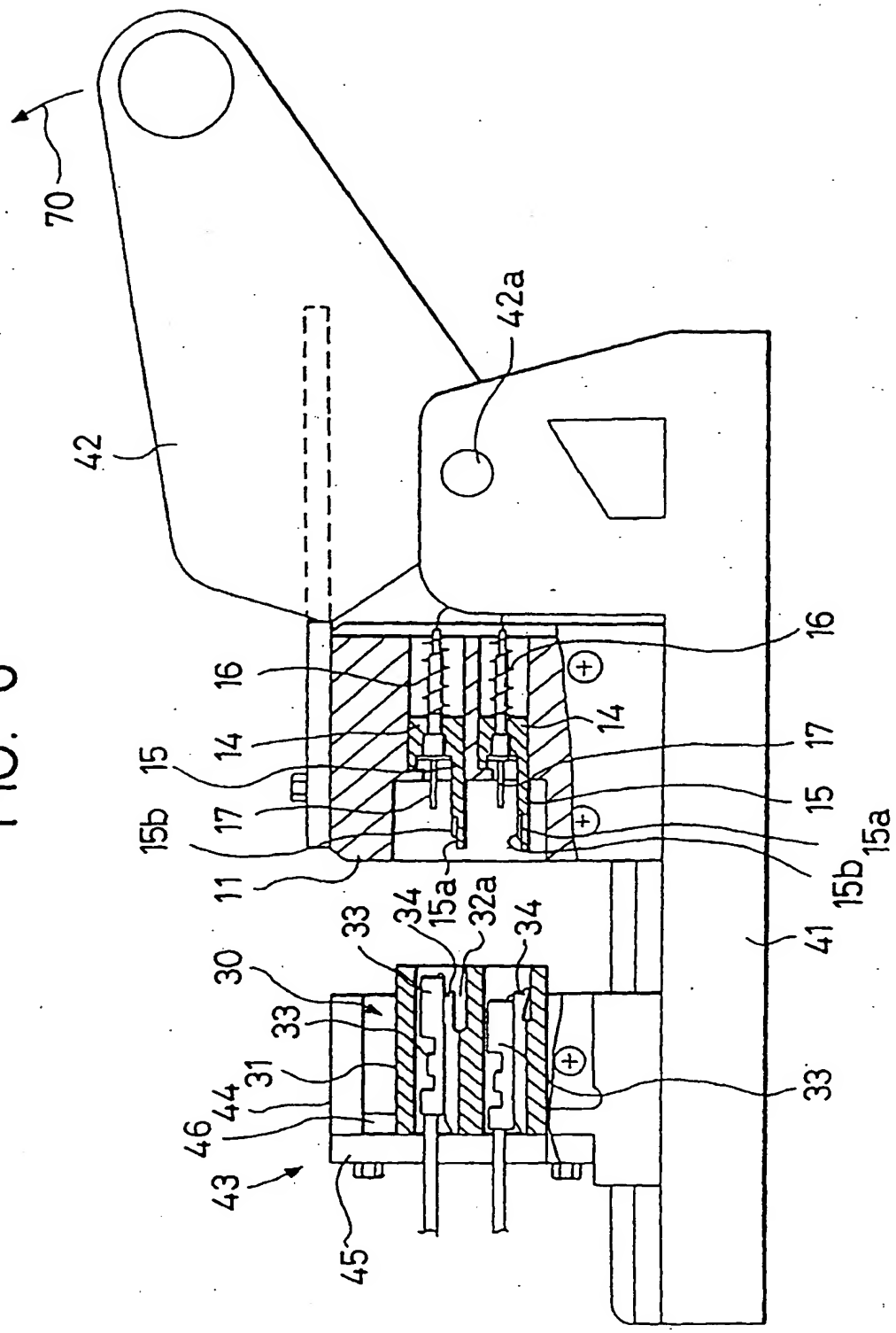

FIG. 7 RELATED ART

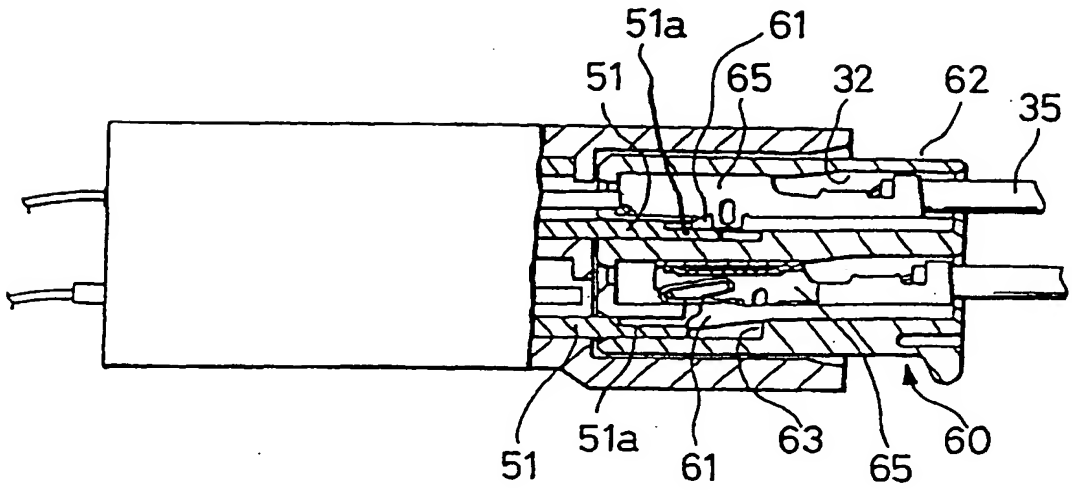

FIG. 8 RELATED ART